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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/674,675	09/29/2003	Zhisong Huang	LAM1P168X1/P1164X	5003
22434	7590	11/15/2005	EXAMINER	
BEYER WEAVER & THOMAS LLP P.O. BOX 70250 OAKLAND, CA 94612-0250			DEO, DUY VU NGUYEN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 11/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/674,675	Applicant(s) HUANG ET AL.	
	Examiner DuyVu n. Deo	Art Unit 1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 15-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-14 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 15-19 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-8, 11, 13, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu et al. (US 6,617,253) and admitted prior art.

Chu describes an oxide etching method comprising: forming a polymer layer on exposed surfaces of the photoresist mask (claimed trench mask) and vertical sidewalls of the feature with a passivation gas mixture (table 1; col. 3, line 60-65; col. 10, line 26-39; figure 15); etching the feature (claimed trench) through the etching mask with reactive etching mixture containing at least one etching chemical; removing the photoresist (col. 3, line 60-65; col. 9, line 61-65; col. 11, line 8-35). Unlike claimed invention, Chu doesn't describe forming vias in the etch layer. Admitted prior art in the specification teaches a method for forming contact hole having the step of forming vias in the etch layer (page 5, 6; fig. 10). It would have been obvious for one skilled in the art to modify Chu in light of the admitted prior art because it teaches further steps in forming contact hole such as dual damascene structure. The modification would provide claimed invention with a reasonable expectation of success.

Referring to claims 2, 3, Chu shows the passivation and etching step can be repeated one or more times (col. 11, line 38-42; col. 15, line 62-67).

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Referring to claim 4, Chu shows the passivation and etching are performed in a common plasma-processing chamber (col. 6, line 15-65).

Referring to claims 5, 7, Chu teaches that the bias power during the passivation step is 0 or at a range where polymer deposition is more predominant than accelerated plasma etching of the dielectric film (col. 6, line 38-40, line 66-col. 7, line 10). Since the gases are not accelerated toward the substrate because of low or no bias power, this would read on claimed non-directional deposition (CVD, non-etching or negligibly etching deposition) and directional etching.

Referring to claim 6, Chu shows the power supplied for the passivation step is 1700-3300W and for the etching step is source power at 2000-3000W and bias power at 1000-1500W. This would provide ion bombardment energy, in the passivation step, of greater than 100 electron volts.

Referring to claim 8, Chu teaches the polymer chemical (deposition gas) includes, CH₃F, C₂H₂, CH₄, CH₂F₂, and Ar (col. 3, line 60-65; col. 9, line 1-12; col. 10, line 37-39) and the etching gas comprises of CF₄, C₂F₆ (col. 13, line 12-17).

Referring to claim 13, Chu doesn't show a sacrificial filler material in the via holes prior to the start of the trench plasma etching process.

Referring to claim 20, since method includes repeating the deposition and etching processes, some of the deposition gas mixture would not be mixed with the etching gas mixture (col. 3, line 46-50).

3. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chu and admitted prior art as applied to claim 1 above, and further in view of Tang et al. (US 6,211,092).

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Referring to claim 12, Chu is silent about the etch layer is a low-k dielectric layer. Tang teaches a same method of forming contact hole wherein he uses etch layer including oxide, and low-k dielectric layer (col. 1, line 30-37; col. 14, 42-50). It would have been obvious for one skilled in the art to use layer including low-k dielectric layer to form a dual damascene structure since it is desired to used a low-k dielectric layer as inter-level dielectric layer as taught by Tang (col. 1, line 30-37).

4. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chu and admitted prior art as applied to claim 1 above, and further in view of Bhardwaj et al. (US 6,051,503).

Referring to claim 9, applied prior art above doesn't suggest the deposition gas including H₂. However, using H₂ with the deposition gas is well known to one skilled in the art at the time of the invention as shown here by Bhardwaj (col. 5, line 33). Therefore, it would have been obvious for one skilled in the art to use H₂ with the deposition gas because Bhardwaj suggests that it is used to dilute the deposition gas (col. 3, line 33).

The gas flow rate would be a result-effective variable and must be determined through routine experimentation in order to provide optimum gas flow rate for the deposition of the protective layer with a reasonable expectation of success.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chu and admitted prior art as applied to claim 1 above, and further in view of Hussein et al. (US 6,406,995).

Unlike claimed invention, applied prior art above doesn't describe he via holes are filled with a filler material to no more than 50% of the via hole height prior to the start of the trench etching process. Hussein teaches a method for forming dual damascene structure wherein the via

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hole is filled with a material to about 50% prior to the start of the trench etching process (fig. 6; col. 5, line 15-48). It would have been obvious for one skilled in the art at the time of the invention to modify the above prior art in light of Hussein because he teaches that filling the via with this material would protect the underlying interconnections during the trench etching process (col. 3, line 1-13).

Response to Arguments

6. Applicant's argument that Chu fails to teach etching trenches but only contact holes, which are vias is found unpersuasive because trenches are formed for the contacting purposes of the interconnects therefore, they are also contact holes. Therefore, Chu's contact holes can be used as trenches.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., forming a trench with vias are first formed would prevent faceting or the claimed method would prevent faceting at a bottom of a trench) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Terminal Disclaimer

7. The terminal disclaimer filed on 9/2/05 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of US patent 6,833,325 and US patent 6,916,746 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Rejections - 35 USC § 112

8. Claim 20 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. it is unclear wherein the specification teaching the limitation of claim 20.

Election/Restrictions

9. Applicant's withdrawal of claims 15-19 in the reply filed on 9/2/05 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n. Deo whose telephone number is 571-272-1462. The examiner can normally be reached on 6:00-2:30 Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Primary Examiner
Duy-Vu N. Deo
11/10/05

